

CubeSat-based Science Missions for Space Weather and Atmospheric Research

Program Solicitation

10-537

Replaces Document(s):
NSF 09-523



National Science Foundation

Directorate for Geosciences
Division of Atmospheric and Geospace Sciences

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

May 18, 2010

May 18, Annually Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

Please be advised that the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) includes revised guidelines to implement the mentoring provisions of the America COMPETES Act (ACA) (Pub. L. No. 110-69, Aug. 9, 2007.) As specified in the ACA, each proposal that requests funding to support postdoctoral researchers must include a description of the mentoring activities that will be provided for such individuals. Proposals that do not comply with this requirement will be returned without review (see the PAPP Guide Part I: *Grant Proposal Guide* Chapter II for further information about the implementation of this new requirement).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

CubeSat-based Science Missions for Space Weather and Atmospheric Research

Synopsis of Program:

Lack of essential observations from space is currently a major limiting factor in space weather research. Recent advances in sensor and spacecraft technologies make it feasible to obtain key measurements from low-cost, small satellite missions. A particularly promising aspect of this development is the prospect for obtaining multi-point observations in space that are critical for addressing many outstanding problems in space science. Space-based measurements from small satellites also have great potential to advance discovery and understanding in other areas of atmospheric sciences. To take full advantage of these developments, NSF is soliciting research proposals centered on small satellite missions.

The overarching goal of the program is to support the development, construction, launch, operation, and data analysis of small satellite science missions to advance space weather and atmospheric research. Equally important, it will provide essential opportunities to train the next generation of experimental space scientists and aerospace engineers.

To facilitate launch of the satellites as secondary payloads on existing missions, the focus of the program is on CubeSat-based satellites. Launch of the satellites will be through the standardized CubeSat deployment system, the Poly Picosatellite Orbital Deployer (P-POD). Launch of the P-PODS will be as auxiliary payloads on DOD, NASA, or commercial launches. This will be arranged directly by NSF and is not part of

this solicitation. Beginning in 2009, NSF expects to launch two to three P-PODs every year, accommodating at least as many (two to six) individual satellite missions. This solicitation covers proposals for science missions to include satellite development, construction, testing and operation as well as data distribution and scientific analysis.

Cognizant Program Officer(s):

- Therese Moretto Jorgensen, telephone: (703) 292-8518, email: tjorgens@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.050 --- Geosciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 1 to 2

Anticipated Funding Amount: \$500,000 to \$900,000 annually, pending availability of funds.

Eligibility Information

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposals:**
 - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
 - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required under this solicitation.
- **Indirect Cost (F&A) Limitations:** Not Applicable

- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

May 18, 2010

May 18, Annually Thereafter

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions: Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

"Space weather" refers to conditions on the sun and in the space environment that can influence the performance and reliability of space-borne, Earth-based, and planetary technological systems and endanger human life or health. Adverse conditions in the space environment can cause disruption to satellite operations, communication, aviation, navigation, electric power distribution grids, and space travel leading to a variety of socioeconomic losses. The National Space Weather Program (NSWP) is a multi-agency Federal program that promotes basic research focused on space weather. A recent high-level

panel assessing the NSWP recommended the creation of a small satellite program to address space weather goals. Further information about NSWP objectives can be obtained from the National Space Weather Program Strategic Plan and Implementation Plan. Both of these documents are available online through the program website at <http://www.nswp.gov>.

An effective National Space Weather Program requires a strong commitment to basic research in many areas of space-related science. Emphasis is on understanding the fundamental physical processes that affect the state of the Sun, solar wind, magnetosphere, ionosphere, and upper atmosphere, while focusing on answering research questions that will improve the ability to specify and predict conditions in the space environment.

Lack of essential observations from space is currently a major limiting factor in space weather research. Recent advances in sensor and spacecraft technologies make it feasible to obtain key measurements from low-cost, small satellite missions. A particularly promising aspect of this development is the prospect of obtaining multi-point observations in space that are critical for addressing many outstanding problems in space science. Space-based measurements from small satellites also have great potential to advance discovery and understanding in other areas of atmospheric sciences.

National space policy emphasizes the need to develop a strong workforce and to ensure continued US leadership in space understanding and utilization. This new NSF initiative is designed to address these needs. Specifically, the small satellite program will invest in facilities and instrumentation that support transformative technologies and will promote the development of a Science, Technology, Engineering, and Mathematics (STEM) workforce for the 21st Century.

II. PROGRAM DESCRIPTION

The overarching goal of the program is to execute small scientific satellite missions to advance space weather and atmospheric research. Equally important, it will provide essential opportunities to train the next generation of experimental space scientists and aerospace engineers. The program will support the development, construction, launch, and operation of small satellite systems as well as the distribution and analysis of the science data from the missions.

To facilitate launch of the satellites as secondary payloads, the focus of the program is on CubeSat-based satellites to be launched in California Polytechnic's standardized CubeSat deployment system, the Poly Picosatellite Orbital Deployer (P-POD). CubeSat and P-POD design specifications and guidance are open-source community standards and can be found at: <http://www.cubesat.org>. Under this program it is expected that 2 to 3 P-PODS will be launched every year, starting in 2009, accommodating at least as many individual satellite missions. Proposed missions are expected to fully comply with accepted CubeSat standards and proposals must clearly state and justify any deviations therefrom. Specifically, it is incumbent on proposals to clearly demonstrate that the proposed satellites can be launched by P-POD. If deviations are desired proposers should contact a cognizant NSF Program Officer before preparing a proposal for submission.

Awards funded through this solicitation are for science missions to include design, construction, testing and operation of satellites as well as data distribution and scientific analysis. To be considered for an award, proposals must describe complete science missions, including all of the above components. Leverage of other funding sources is allowed and encouraged. In the case that only partial funding for a mission is sought through this solicitation, a complete description of the mission is still required for the proposal and the proposal will be evaluated based on the full mission. The forming of appropriate collaborations that cover all the necessary areas of expertise within space science as well as aerospace engineering is also strongly encouraged. Emphasis of this solicitation is on space weather research but proposals for missions within other areas of atmospheric sciences will also be considered.

Launch of the P-PODS will be as auxiliary payloads on DOD, NASA, or commercial launches. This will be arranged directly by NSF and is not part of this solicitation. Likewise the integration of satellites into P-PODS and final testing of the fully integrated payloads to satisfy the requirements of the launch provider will also be handled by NSF independently of this solicitation. NSF will assist with frequency allocation and licensing for space and ground systems as needed.

Additional technical information relevant to the program is posted on the NSF program web-site and will be updated as new information becomes available. This includes information on possible future launch opportunities; manifested launch opportunities; orbital information; requirements for launch qualification testing; and telemetry licensing and specification.

Education and workforce development are important aspects of the program. Therefore, to be eligible for an award, proposals must include training opportunities for students as well as significant student participation in all aspects of the proposed projects.

III. AWARD INFORMATION

Typical awards from this competition are expected to be \$100,000 - \$300,000 per year for 3 to 4 years, not to exceed a total of \$900,000. NSF expects to fund approximately 1 to 2 awards depending on the quality of submissions and the availability of

funds. Up to \$900,000 will be available for the competition every year. The program budget, number of awards and average award size/duration are subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the [Grant Proposal Guide](#), Chapter I, Section E.

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.4 of the Grant Proposal Guide provides additional information on collaborative proposals.

Supplemental instructions

The following instructions supplement the *NSF GPG* guidelines. **Proposals not following these instructions are subject to return without review**

Cover Page:

Proposal titles should begin with the word "CubeSat".

Project Description:

1. Proposals should include a description of the science objectives and measurements planned for the proposed mission.
2. Proposals should include a description of the relevance of the proposed research mission to current space weather or atmospheric science research goals.
3. Proposals should include a description of orbital requirements for the mission and should discuss the potential impacts on the science objectives of all possible orbit scenarios.
4. Proposals should include a description of the technical approach of the instruments, various spacecraft subsystems (such as micro-controller, power, attitude control system, and communication), and mission operations, including ground station(s) and data distribution.
5. Proposals should include a detailed description of the technological readiness or heritage of the proposed technical approaches.
6. Any deviations from accepted CubeSat standards must be clearly stated and justified, and the proposal must clearly demonstrate that the deviations will not pose a problem for launching the satellite by P-POD. Deviations should not be considered without prior consultation with a cognizant NSF Program Officer.
7. Proposals should include a description of the student training opportunities and student involvement that the project will offer as well as any other educational activities that the proposal will support.

Special Information and Supplementary Documentation:

The following special information must be provided as a *Supplementary Document*. This information is not considered part of the 15-page project description limitation but should not exceed a total of 5 pages.

1. A detailed management plan including a description of the risk reduction approach being adopted.
2. A detailed project schedule.
3. A satellite and subsystem environmental testing plan that conforms to the CubeSat standard and a plan for how to meet additional testing requirements that may be issued by the launch provider.
4. A description of reviews planned during development and test.

B. Budgetary Information

Cost Sharing: Cost sharing is not required under this solicitation.

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

May 18, 2010

May 18, Annually Thereafter

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Website at: <https://www.fastlane.nsf.gov/fastlane.jsp>.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: <http://www.grants.gov/CustomerSupport>. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal preparation requirements. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal.

A. NSF Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board (NSB)-approved merit review criteria: intellectual merit and the broader impacts of the proposed effort. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two NSB-approved merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgements.

What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Examples illustrating activities likely to demonstrate broader impacts are available electronically on the NSF website at: <http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>.

Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.

NSF staff also will give careful consideration to the following in making funding decisions:

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

Additional Review Criteria:

Relevance of the proposed research to space weather or atmospheric science Proposals will be evaluated according to their relevance to current space weather research goals or to key outstanding science questions within other areas of atmospheric sciences.

Student training Proposals will be evaluated according to the student training opportunities they offer and to the degree of student involvement in the various aspects of the proposed missions.

Technical feasibility Proposals will be evaluated according to their degree of technological readiness or heritage, or the degree to which they make use of emerging technologies. Proposals will also be evaluated according to their compliance with CubeSat and P-POD standards.

Management plan Proposals will be evaluated according to the soundness of their plans for management, scheduling, and risk reduction during the satellite development and operations phases of the mission, respectively.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review, or technical evaluation in collaboration with NASA and/or DOD.

--Additional technical evaluation After completion of the initial review and selection process, proposals being considered for funding may be subject to further technical evaluations performed in collaboration with NASA and/or DOD. The purpose of this additional review is to assess the feasibility of the proposed approach for mission implementation (technical, management, schedule, and cost). Specifically, the objective is to identify any deficiencies that could substantially affect the proposer's ability to meet the technical objectives of the proposal within the proposed cost and schedule. --Orbital requirement Proposals being considered for funding will also be evaluated according to the availability of suitable launch opportunities that meet the orbital requirements of the proposed science mission.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (GC-1); * or Research Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

Special Award Conditions:

- Once a suitable launch opportunity for the selected science mission has been identified and manifested by NSF, Principal Investigators will be responsible for satisfying the environmental testing requirements at the satellite level, including the provision of specific documentation, appropriate for that particular launch vehicle.
- As soon as a launch date has been set, a schedule for completion, testing, and delivery of the payload within the given time-frame must be submitted by the Principal Investigators and approved by a cognizant NSF Program Officer.
- During the design, building, and testing phase of the mission it is expected that awardees will have regular dialogue and/or status reviews with cognizant NSF Program Officers to ensure satisfactory progress and the timely completion of the payload.
- Principal Investigators will ensure the on-time delivery of their payload along with any required documentation for P-POD integration and testing prior to launch.
- Principal Investigators will participate in the timely resolution of any problems encountered during P-POD integration and testing.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

Therese Moretto Jorgensen, telephone: (703) 292-8518, email: tjorgens@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, National Science Foundation Update is a free e-mail subscription service designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the [NSF web site](#).

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this new mechanism. Further information on Grants.gov may be obtained at <http://www.grants.gov>.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
 - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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